

AD

TECHNICAL REPORT

69-4-FL

EVALUATION OF CANNED MEATS IN THE  
CIVILIAN MARKET FOR MILITARY USE

by

B. W. Gardner, Jr.

July 1968

UNITED STATES ARMY  
NATICK LABORATORIES  
Natick, Massachusetts 01760



Food Laboratory

FL-69

This document has been approved for public release and sale;  
its distribution is unlimited.

The findings in this report are not to be construed as an  
official Department of the Army position unless so designated  
by other authorized documents.

Citation of trade names in this report does not constitute  
an official indorsement or approval of the use of such items.

Destroy this report when no longer needed. Do not return  
it to the originator.

This document has been approved  
for public release and sale; its  
distribution is unlimited.

AD \_\_\_\_\_

TECHNICAL REPORT

69-4-FL

EVALUATION OF CANNED MEATS IN THE  
CIVILIAN MARKET FOR MILITARY USE

by

B. W. Gardner, Jr.

Project reference:  
AE 661

Series: FL-63

July 1968

Food Laboratory  
U. S. ARMY NATICK LABORATORIES  
Natick, Massachusetts 01760

## FOREWORD

The military consumer has made many unfavorable comparisons of the canned meat in his rations to the canned meat he consumed as a civilian. Potential economies exist if canned meat in the civilian market could be used by the military.

However, military standards for canned meat used in the rations differ from that used by the civilian consumer. The military consumer needs added calories and protein that the civilian consumer does not need; and in most instances, does not want. The acceptability of a canned meat in the ration must be retained for a long period of time. Canned meat reaches the civilian consumer after a brief period of time.

Conforming as close as possible to the minimum requirements of the military specification, while practicing economies in manufacturing cost that will permit selling at a low bid price contributes to profit in the military market. Resale appeal and advertising contribute to profit in the civilian market.

These conditions justify the evaluation reported herein.

## TABLE OF CONTENTS

	<u>Page No.</u>
<b>Foreword</b> . . . . .	iii
<b>List of Tables</b> . . . . .	v
<b>Abstract</b> . . . . .	vi
<b>Introduction</b> . . . . .	1
<b>Method</b> . . . . .	1
<b>Results</b> . . . . .	2
<b>Discussion</b> . . . . .	26
<b>Conclusion</b> . . . . .	27
<b>References</b> . . . . .	28

LIST OF TABLES

<u>Table No.</u>		<u>Page No.</u>
I	Container Suitability and Composition of Casserole Canned Meat Items . . . . .	3
II	Evaluation of Stew and Hash Canned Meat Items . . . . .	6
III	Evaluation of Meat & Gravy Canned Meat Items . . . . .	7
IV	Evaluation of Ham Canned Meat Items . . . . .	8
V	Evaluation of Poultry Canned Meat Items . . . . .	9
VI	Evaluation of Beef Canned Meat Items . . . . .	10
VII	Evaluation of Pork & Sausage Canned Meat Items . . . . .	11
VIII	Evaluation of Fish Canned Meat Items . . . . .	12
IX	Acceptance Values for Casserole Canned Meat Items . . . . .	13
X	Acceptance Values for Stew & Hash Canned Meat Items . . . . .	17
XI	Acceptance Values for Meat & Gravy Canned Meat Items . . . . .	18
XII	Acceptance Values for Ham Canned Meat Items . . . . .	19
XIII	Acceptance Values for Poultry Canned Meat Items . . . . .	20
XIV	Acceptance Values for Beef Canned Meat Items . . . . .	21
XV	Acceptance Values for Pork & Sausage Canned Meat Items . . . . .	22
XVI	Summary of Composition Attributes . . . . .	23
XVII	Summary of Acceptance and Container Suitability . . . . .	25

## ABSTRACT

Canned meat food items available on the civilian market were analyzed for protein and caloric content and evaluated for acceptability before and after storage at 100°F for six months.

A survey was made of the published reports of evaluations of military canned meat items to obtain comparative data.

In general, the canned meats obtained in the civilian market were more acceptable initially but a number did not retain their acceptability under the storage conditions. In addition, a great number did not have the concentration of protein and calories required by the military consumer.

## INTRODUCTION

This study was undertaken to determine the capabilities of canned meat in the civilian market to satisfy military product characteristic requirements. Every effort was made to investigate representative types of all canned meats.

The needs of the military consumer, different than the civilian consumer, limit acceptable container sizes, nutrient level and stability. Packaged rations use a 300 by 200 and a 300 by 308 size can. The B Ration uses No. 2-1/2, No. 10 and 6 lb. pullman cans. Adequate nutrient content and palatability after six months' exposure to 100° F is a basic requirement for military rations. Minimum nutritional requirements of 3600 calories and 100 grams of protein per man per day must be met. Rations meeting this nutritional design must have over 1/3 of the canned meats with at least 20 grams of protein per 100 grams and not more than 1/10 with less than 10 grams of protein per 100 grams of product. In addition, no canned meat can have less than 100 calories per 100 grams of the product and over 1/5 must have at least 200 calories per 100 grams.

In this study, civilian canned meat items were analyzed for protein and calorie content and for acceptance before and after storage. The data obtained was compared with comparable data obtained from evaluation of military specification products.

## METHOD

Canned meats were purchased at area supermarkets. Five cans of each meat item from each manufacturer were selected at random for chemical analysis. The analyses were made by the AOAC methods. (7) Calories per 100 grams of product were calculated from this data. Twenty cans of each canned meat from each manufacturer were used for determining the acceptability value using a 9-point hedonic scale (1 = dislike extremely to 9 = like extremely) before and after storing at 100° F for six months. Half of the number of cans were used each time. The affected single stimulus preference method defined by Pilgrim and Peryam (8) was employed in determining the acceptance of the canned meats in the civilian market as well as the acceptance data on military canned meats obtained from published reports (1,2,3,5,6). The values selected from the reports were those that appeared most frequently. They were limited to values obtained in formal storage studies or field tests. The values reported in "Long-Term Storage of Military Rations" (4) did not represent the same increments of value as those found in the other reports. Therefore, they were used for verification only.

## RESULTS

The results of determining the can size, chemical analysis acceptance value and stability are presented in Tables I through XV.

TABLE I. CONTAINER SUITABILITY AND COMPOSITION OF  
CASSEROLE CANNED MEAT ITEMS

Product Identification	The Can Size is Suitable for Military Use.	Gms. of Protein per 100 gms. of product	Calories per 100 gms. of product
Beans w/Frankfurter Chunks in Tomato Sauce (Military) <sup>a/</sup>	Yes	7.50	136.00
Beans & Franks in Tomato Sauce (Company A) <sup>b/</sup>	No	14.13	139.09
Beans & Ground Beef in BBQ Sauce (Company A) <sup>b/</sup>	No	4.67	169.55
Beef & Peas w/Gravy (Military) <sup>a/</sup>	Yes	15.20	122.60
Beef & Vegetables w/Gravy (Military) <sup>a/</sup>	Yes	9.60	107.50
Beef Slices & Potatoes w/Gravy (Military) <sup>a/</sup>	Yes	13.40	101.80
Beef w/Spiced Sauce (Military) <sup>a/</sup>	Yes	23.80	205.00
Chicken & Noodles (Military) <sup>a/</sup>	Yes	9.50	144.30

a. Manufactured under Government specification.

b. Manufactured under private specification.

TABLE I. CONTAINER SUITABILITY AND COMPOSITION OF  
CASSEROLE CANNED MEAT ITEMS (cont'd)

Product Identification	The Can Size is Suitable for Military Use.	Gms. of Protein per 100 gms. of product	Calories per 100 gms. of product
Chicken w/Vegetables (One-Pie) (Company B) <sup>b/</sup>	No	6.07	70.40
Chili con Carne w/Beans (Military) <sup>a/</sup>	Yes	7.50	133.00
Chili w/Beans (Company C) <sup>b/</sup>	No	6.66	145.43
Egg Noodles and Tuna (Company D) <sup>b/</sup>	No	7.40	83.28
Ham & Kidney Beans in Sauce (Military) <sup>a/</sup>	Yes	11.20	151.60
Ham & Lima Beans (Military) <sup>a/</sup>	Yes	12.00	175.20
Ham & Potatoes w/Gravy (Military) <sup>a/</sup>	Yes	10.60	144.00
Macaroni w/Beef in Tomato Sauce (Company E) <sup>b/</sup>	No	4.83	109.20
Macaroni & Beef w/Tomato Sauce (Company F) <sup>b/</sup>	No	4.35	104.49
Meat Balls & Beans in Tomato Sauce (Military) <sup>a/</sup>	Yes	10.80	133.10

a. Manufactured under Government specification.

b. Manufactured under private specification.

TABLE I. CONTAINER SUITABILITY AND COMPOSITION OF  
CASSEROLE CANNED MEAT ITEMS (cont'd)

Product Identification	The Can Size is Suitable for Military Use	Gms. of Protein per 100 gms. of product	Calories per 100 gms. of product
Spaghetti w/Meat Balls in Sauce (Military) <sup>a/</sup>	Yes	10.70	131.80
Spaghetti & Meat Balls in Tomato Sauce (Company E) <sup>b/</sup>	No	5.14	110.99
Spaghetti w/Meat Balls in Tomato Sauce (Company G) <sup>b/</sup>	No	4.68	117.51
Spaghetti w/Ground Meat (Military) <sup>a/</sup>	Yes	9.50	132.10
Spaghetti w/Ground Beef in Tomato Sauce (company G) <sup>b/</sup>	No	3.29	97.56
Spaghetti w/Meat Sauce (Company H) <sup>b/</sup>	No	3.38	109.99

a. Manufactured under Government specification.

b. Manufactured under private specification.

TABLE II. EVALUATION OF STEW AND HASH  
CANNED MEAT ITEMS

Product Identification	The Can Size is Satisfactory for Military Use	Gms. of Protein per 100 gms. of product	Calories per 100 gms. of product
<b>Beef Stew</b>			
(Military)a/	Yes	9.90	99.60
(Company I)b/	Yes	6.28	74.33
(Company J)b/	Yes	5.22	72.90
(Company H)b/	No	7.14	112.33
(Company K)b/	No	7.03	71.44
(Company L)b/	Yes	7.46	92.62
(Company M)b/	No	8.42	83.07
<b>Chicken Stew</b>			
(Company M)b/	No	6.15	78.93
(Company K)b/	No	4.88	62.01
(Company O)b/	Yes	5.15	67.58
<b>Chicken Stew</b>			
(Company N)b/	Yes	4.77	76.11
<b>Corned Beef Hash</b>			
(Military)a/	Yes	8.80	181.00
(Company P)b/	No	6.65	207.55
(Company F)b/	No	6.00	234.83
(Company L)b/	No	7.27	200.69
(Company H)b/	No	6.36	201.13
(Company J)b/	No	6.67	163.78
(Company O)b/	No	10.49	188.79
(Company Q)b/	No	9.40	203.69
<b>Meat Ball Stew</b>			
(Company E)b/	Yes	5.62	122.46
<b>Roast Beef Hash</b>			
(Company H)b/	No	6.47	249.51
(Company P)b/	No	8.51	162.03
(Company Q)b/	No	11.03	135.82

a. Manufactured under Government specification.

b. Manufactured under private specification.

TABLE III. EVALUATION OF MEAT AND GRAVY CANNED MEAT ITEMS

Product Identification	The Can Size is Satisfactory for Military Use	Gms. of Protein per 100 gms. of product	Calories per 100 gms. of product
All Beef Burgers in Brown Gravy (Company R) <u>b/</u>	No	9.84	185.68
Beef in Gravy (Company F) <u>b/</u>	-	7.43	82.60
Beef w/Gravy (Military) <u>a/</u>	Yes	18.80	169.10
Ham w/Gravy (Military) <u>a/</u>	Yes	14.40	216.00
Meat Balls in Beef Gravy (Company E) <u>b/</u>	No	6.48	143.64
Pork w/Gravy (Military) <u>a/</u>	Yes	15.87	192.67

a. Manufactured under Government specification.

b. Manufactured under private specification.

TABLE IV. EVALUATION OF HAM CANNED MEAT ITEMS

Product Identification	The Can Size is Satisfactory for Military Use	Gms. of Protein per 100 gms. of product	Calories per 100 gms. of product
Ham Chunks (Military) <sup>a/</sup>	Yes	19.00	219.90
Ham Chopped <sup>c/</sup> (Company J) <sup>b/</sup>	No	15.82	226.18
(Company C) <sup>b/</sup>	No	13.95	284.32
Ham Sterile <sup>d/</sup> (Company S) <sup>b/</sup>	Yes	11.78	214.07
(Company C) <sup>b/</sup>	Yes	17.81	149.23
Ham, Sliced & Fried (Military) <sup>a/</sup>	Yes	21.40	172.70
Ham & Eggs, Chopped (Military) <sup>a/</sup>	Yes	14.10	209.30

---

- a. Manufactured under Government specification
- b. Manufactured under private specification
- c. The civilian item was found to be the same as the military luncheon meat item
- d. The civilian items were found to be the same as the military item, Ham Chunks

TABLE V. EVALUATION OF POULTRY CANNED MEAT ITEMS

Product Identification	The Can Size is Satisfactory for Military Use	Gms. of Protein per 100 gms. of product	Calories per 100 gms. of product
Chicken, Boned (Military) <sup>a/</sup>	Yes	21.30	195.90
(Company T) <sup>b/</sup>	Yes	19.60	173.18
(Company U) <sup>b/</sup>	No	20.77	197.90
(Company N) <sup>b/</sup>	No	20.99	178.09
Chicken ala King (Company N) <sup>b/</sup>	Yes	10.41	100.53
(Company H) <sup>b/</sup>	Yes	13.04	110.32
(Company V) <sup>b/</sup>	Yes	7.13	116.16
Chicken, Boned, w/Gravy (Military) <sup>a/</sup>	Yes	25.40	179.00
Chicken Fricassee (Company N) <sup>b/</sup>	No	7.06	68.18
Chicken Fricassee (Company N) <sup>b/</sup>	No	10.37	88.30
Turkey, Boned (Military) <sup>a/</sup>	Yes	21.00	195.90
(Company V) <sup>b/</sup>	Yes	19.33	140.41
Turkey Fricassee (Company W) <sup>b/</sup>	No	8.14	90.48
Turkey Loaf (Military) <sup>a/</sup>	Yes	21.60	175.30

---

a. Manufactured under Government specification.

b. Manufactured under private specification.

TABLE VI. EVALUATION OF BEEF CANNED MEAT ITEMS

Product Identification	The Can Size is Satisfactory for Military Use	Gms. of Protein per 100 gms. of product	Calories per 100 gms. of product
Beef Steak (Military) <sup>a/</sup>	Yes	25.20	172.80
Corned Beef (Military) <sup>a/</sup>	Yes	25.10	241.50
Hamburgers (Military) <sup>a/</sup>	Yes	21.70	251.30

a. Manufactured under Government specification.

TABLE VII. EVALUATION OF PORK AND SAUSAGE CANNED MEAT ITEMS

Product Identification	The Can Size is Satisfactory for Military Use	Gms. of Protein per 100 gms. of product	Calories per 100 gms. of product
Luncheon Meat (Military) <sup>a/</sup>	Yes	16.39	237.89
Luncheon Meat <sup>c/</sup> (Company C) <sup>b/</sup>	No	17.29	331.57
Luncheon Meat <sup>c/</sup> (Company O) <sup>b/</sup>	No	14.88	314.19
Luncheon Meat <sup>c/</sup> (Company J) <sup>b/</sup>	No	26.97	263.84
Bacon, Sliced & Prefried (Military) <sup>a/</sup>	Yes	24.30	639.00
Pork Luncheon Meat (Military) <sup>a/</sup>	Yes	14.30	280.50
Pork Sausage (Military) <sup>a/</sup>	Yes	16.28	281.72
Frankfurters (Military) <sup>a/</sup>	Yes	13.39	220.70

a. Manufactured under Government specification.

b. Manufactured under private specification.

c. Except for the container the civilian item was found to be the same as the military item.

TABLE VIII. EVALUATION OF FISH CANNED MEAT ITEMS

Product Identification	The Can Size is Satisfactory for Military Use	Gms. of Protein per 100 gms. of product	Calories per 100 gms. of product
Crab Meat <sup>c/</sup> (Military) <sup>a/</sup> (Civilian X) <sup>b/</sup>	Yes	17.40	101.00
	Yes	17.40	101.00
Salmon <sup>c/</sup> (Military) <sup>a/</sup> (Company X) <sup>b/</sup>	Yes	20.29	170.93
	Yes	20.29	170.93
Sardines <sup>c/</sup> (Military) <sup>a/</sup> (Civilian X) <sup>b/</sup>	Yes	19.67	166.30
	Yes	19.67	166.30
Tuna Fish <sup>c/</sup> (Military) <sup>a/</sup> (Civilian X) <sup>b/</sup>	Yes	25.67	247.68
	Yes	25.67	247.68

a. Manufactured under Government specification.

b. Manufactured under private specification.

c. The military item was found to be the same as the civilian item and in some instances the civilian container was not modified.

TABLE IX. ACCEPTANCE VALUES FOR CASSEROLE  
CANNED MEAT ITEMS

Product Identification	Rating by consumers (6.0 = like-slightly)	An import- ant change in rating <sup>b</sup>	
	When Pur- chased	After 6 months at 100°F	After 6 to 12 months at mili- tary supply temp. <sup>a/</sup>
Beans w/Frankfurter Chunks in Tomato Sauce (Military)	7.37	-	6.5
Beans & Franks in Tomato Sauce (Company A)	7.0	6.7	-
Beans & Ground Beef in BBQ Sauce (Company A)	7.5	6.5	-
Beef & Peas w/Gravy (Military)	5.40	-	6.4
Beef & Vegetables w/Gravy (Military)	-	-	7.1
Beef Slices & Potatoes w/Gravy (Military)	6.4	-	-
Beef w/Spiced Sauce (Military)	5.78	-	-

a. Varies from 6 to 18 months at temperatures from 0°F to 100°F.

b. Decrease in rating after storage  $\geq 0.5$ .

TABLE IX. ACCEPTANCE VALUES FOR CASSEROLE  
CANNED MEAT ITEMS (cont'd)

Product Identification	Rating by consumers (6.0 = like-slightly)			An important change in rating <sup>b/</sup>
	When Pur- chased	After 6 months at 100°F	After 6 to 12 months at military supply temp. <sup>a/</sup>	
Chicken & Noodles (Military)	6.5	-	5.8	Yes
Chicken w/Vegetables (Company B)	7.7	7.3	-	No
Chili con Carne w/Beans (Military)	-	-	6.8	-
Chili w/Beans (Company C)	6.6	6.8	-	No
Egg Noodles & Tuna (Company D)	6.1	5.7	-	No
Ham & Kidney Beans in Sauce (Military)	-	-	6.7	-
Ham & Lima Beans (Military)	5.8	-	5.66	No
Ham & Potatoes w/Gravy (Military)	4.96	-	6.9	No

a. Varies from 6 to 18 months at temperatures from 0°F to 100°F.

b. Decrease in rating after storage  $\geq 0.5$ .

TABLE IX. ACCEPTANCE VALUES FOR CASSEROLE  
CANNED MEAT ITEMS (cont'd)

Product Identification	Rating by consumers (6.0 = like-slightly)			An import- ant change in rating <sup>b/</sup>
	When Pur- chased	After 6 months at 100°F	After 6 to 12 months at mili- tary supply temp. <sup>a/</sup>	
Macaroni w/Beef in Tomato Sauce (Company E)	7.3	7.0	-	No
Macaroni and Beef w/Tomato Sauce (Company G)	7.3	6.9	-	No
Meat Balls & Beans in Tomato Sauce (Military)	6.86	-	6.0	Yes
Spaghetti w/Meat Balls in Sauce (Military)	6.6	-	6.8	No
Spaghetti & Meat Balls in Tomato Sauce (Company E)	6.0	6.4	-	No
Spaghetti w/Meat Balls in Tomato Sauce (Company G)	6.4	6.7	-	No

a. Varies from 6 to 18 months at temperatures from 0°F to 100°F.

b. Decrease in rating after storage  $\geq 0.5$ .

TABLE IX. ACCEPTANCE VALUES FOR CASSEROLE  
CANNED MEAT ITEMS (cont'd)

Product Identification	Rating by consumers (6.0 = like-slightly)			An import- ant change in rating <sup>b/</sup>
	When Pur- chased	After 6 months at 100°F	After 6 to 12 months at mili- tary supply temp. <sup>a/</sup>	
Spaghetti w/Ground Meat (Military)	6.6	-	6.8	No
Spaghetti w/Ground Beef in Tomato Sauce (Company G)	7.7	7.3	-	No
Spaghetti w/Meat Sauce (Company H)	7.4	6.6	-	Yes

a. Varies from 6 to 18 months at temperatures from 0°F to 100°F.

b. Decrease in rating after storage  $\geq 0.5$ .

TABLE X. ACCEPTANCE VALUES FOR STEW  
AND HASH CANNED MEAT ITEMS

Product Identification	Rating by consumers (6.0 = like-slightly)			An important change in rating <sup>b/</sup>
	When Pur- chased	After 6 months at 100°F	After 6 to 12 months at mili- tary supply temp. <sup>a/</sup>	
<b>Beef Stew</b>				
(Military)	5.0	-	5.7	No
(Company I)	6.3	6.0	-	No
(Company J)	5.3	6.0	-	No
(Company H)	6.2	4.9	-	Yes
(Company K)	6.4	5.5	-	Yes
(Company L)	6.2	6.0	-	No
(Company M)	6.6	5.9	-	No
<b>Chicken Stew</b>				
(Company M)	7.4	6.5	-	Yes
(Company K)	7.3	6.4	-	Yes
<b>Corned Beef Hash</b>				
(Military)	-	-	-	-
(Company P)	4.6	4.9	-	No
(Company L)	6.4	6.2	-	No
(Company H)	5.5	5.0	-	No
(Company J)	6.1	6.0	-	No
<b>Meat Ball Stew</b>				
(Company E)	7.4	6.9	-	Yes
<b>Roast Beef Hash</b>				
(Company H)	5.5	5.2	-	No
(Company P)	5.3	5.9	-	No
(Company Q)	6.5	6.7	-	No

a. Varies from 6 to 18 months at temperatures from 0°F to 100°F.

b. Decrease in rating after storage  $\geq 0.5$ .

TABLE XI. ACCEPTANCE VALUES FOR MEAT  
AND GRAVY CANNED MEAT ITEMS

Product Identification	When Pur- chased			After 6 months at 100° F	After 6 to 12 months at military supply temp. <sup>a/</sup>	An important change in rating <sup>b/</sup>
All Beef Burgers in Brown Gravy (Company R)	7.3			6.3	-	Yes
Beef w/Gravy (Military)	6.1			-	6.8	No
Ham w/Gravy (Military)	6.8			-	6.4	No
Meat Balls in Beef Gravy (Company E)	6.9			6.6	-	No
Pork w/Gravy (Military)	7.1			-	6.5	Yes

a. Varies from 6 to 18 months at temperatures from 0° F to 100° F.

b. Decrease in rating after storage  $\geq 0.5$ .

TABLE XIII. ACCEPTANCE VALUES FOR  
HAM CANNED MEAT ITEMS

Product Identification	Rating by consumers (6.0 = like-slightly)			An important change in rating <sup>b/</sup>
	When Pur- chased	After 6 months at 100°F	After 6 to 12 months at mili- tary supply temp. <sup>a/</sup>	
Ham, Chunks (Military)	6.8	-	7.0	No
Ham, Chopped (Company J)	6.3	5.4	-	Yes
(Company C)	6.5	5.5	-	Yes
Ham, Sliced & Fried (Military)	5.39	-	6.0	No
Ham & Eggs, Chopped (Military)	6.0	-	6.2	No

a. Varies from 6 to 18 months at temperatures from 0° to 100°F.

b. Decrease in rating after storage  $\geq 0.5$ .

TABLE XIII. ACCEPTANCE VALUES FOR  
POULTRY CANNED MEAT ITEMS

Product Identification	Rating by consumers (6.0 = like-slightly)			An important change in rating <sup>b/</sup>
	When Pur- chased	After 6 months at 100°F	After 6 to 12 months at military storage temp. <sup>a/</sup>	
Chicken Boned (Military)	5.8	-	6.3	No
(Company T)	6.3	6.6	-	No
(Company U)	6.4	5.6	-	Yes
(Company N)	6.4	6.3	-	No
(Company V)	7.0	6.5	-	Yes
Chicken ala King (Company N)	6.0	5.7	-	No
(Company H)	7.4	5.4	-	Yes
(Company V)	7.4	6.6	-	Yes
Chicken, Boned w/Gravy (Military)	6.9	-	6.6	No
Chicken Fricassee (Company N)	7.0	6.5	-	Yes
Chicken Fricassee (Company N)	7.0	6.5	-	Yes
Turkey Boned (Military)	7.0	-	6.9	No
(Company V)	3.2	6.9	-	No
Turkey Fricassee (Company W)	6.2	5.8	-	No
Turkey Loaf (Military)	6.9	-	-	-

a. Varies from 6 to 18 months at temperatures from 0°F to 100°F.

b. Decrease in rating after storage  $\geq 0.5$ .

TABLE XIV. ACCEPTANCE VALUES FOR  
BEEF CANNED MEAT ITEMS

Product Identification	Rating by consumers (6.0 = like-slightly)			An important change in rating <sup>b/</sup>
	When Pur- chased	After 6 months at 100°F	After 6 to 12 months at military supply temp. <sup>a/</sup>	
Beef Steak (Military)	5.57	-	6.6	Yes
Corned Beef (Military)	6.5	-	-	-
Hamburgers (Military)	5.6	-	-	-

a. Varies from 6 to 18 months at temperatures from 0°F to 100°F.

b. Decrease in rating after storage  $\geq 0.5$ .

TABLE XV. ACCEPTANCE VALUES FOR PORK  
AND SAUSAGE CANNED MEAT ITEMS

Product Identification	Rating by consumers (6.0 = like-slightly)			An important change in rating <sup>b/</sup>
	When Pur- chased	After 6 months at 100°F	After 6 to 12 months at mili- tary supply temp. <sup>a/</sup>	
Luncheon Meat (Military)	5.4	-	7.3	No
(Company C)	5.8	5.6	-	No
(Company O)	5.8	5.8	-	No
(Company J)	5.6	4.9	-	Yes
Pork Luncheon Meat (Military)	5.4	-	7.3	No
Pork Sausage (Military)	-	-	6.2	-
Frankfurters (Military)	6.4	-	5.6	Yes

a. Varies from 6 to 18 months at temperatures from 0°F to 100°F.

b. Decrease in rating after storage  $\geq 0.5$ .

TABLE XVI. SUMMARY OF COMPOSITION ATTRIBUTES

Attribute	Percent of the canned meat items* in the:	
	Civilian Market	Military Market
High Protein (More than 20 grams of protein per 100 grams of product.)	9	30
Medium Protein (Less than 20 but more than 10 grams of protein per 100 grams of product.)	28	51
Low Protein (Less than 10 grams of protein per 100 grams of product.)	63	19
High Calories (More than 200 cal. per hundred grams of product.)	23	32
Medium Calories (Less than 200 but more than 100 cal. per hundred grams of product.)	46	65
Low Calories (Less than 100 cal. per hundred grams of product.)	31	3
High Protein/High Calorie	4	14
Low Protein/Low Calorie	27	3

---

\* N = 56 civilian  
37 military

TABLE XVI. SUMMARY OF COMPOSITION ATTRIBUTES

Attribute	Percent of the canned meat items* in the:	
	Civilian Market	Military Market
High Protein/Low Calorie	0	0
Low Protein/High Calorie	11	0
Medium Protein/Medium Calorie	18	30
High Protein/Medium Calorie	5	19
Low Protein/Medium Calorie	25	16
Medium Protein/High Calorie	9	19
Medium Protein/Low Calorie	2	0

---

\* N = 56 civilian  
37 military

TABLE XVII. SUMMARY OF ACCEPTANCE  
AND CONTAINER SUITABILITY

Attribute	Percent of the Canned Meat Items in the:	
	Civilian Market	Military Market
<u>ACCEPTANCE</u>		
Rating of "like-slightly" (6.0 or above) when purchased	84	56
Rating of "like-slightly" (6.0 or above) after storage	62	85
No important change in acceptance	62	73
<u>CONTAINER SUITABILITY</u>		
Food items contained in a suitable size container	26	100

## DISCUSSION

Tables XVI and XVII express a summary of the results as the percent of the civilian or military market canned meat items that possess an attribute or a combination of attributes. Nearly 1/3 of the military market canned meat items were high in protein as compared to less than 1/10 of the civilian market canned meat items. There were over three times as many civilian market canned meat items in the low protein groups and ten times more in the low calorie group.

The combination of attributes or total nutrient composition is also important. Over three times more military market canned meat items were in the high protein/high calorie group and nearly twice as many military market canned meat items in the medium protein/medium calorie group. On the other hand, over ten times more civilian market canned meat items were in the low protein/high calorie group and nine times more were in the low protein/low calorie group.

Slightly over twenty-five percent more of the civilian market canned meat items, when purchased, were liked slightly or better. This superiority was not retained because nearly twenty-five percent more of the military market canned meat items, after storage, were liked slightly or better. Furthermore, over ten percent more of the military canned meat items had no important change in acceptance during storage. Of importance, only 26 percent of the civilian market canned meat items were in suitable size containers.

Changing the size of the container used for a canned meat item in the civilian market to a size suitable for military ration use is complicated. Consideration of this problem is not a part of this review. Poor acceptability of the canned meat items in the civilian market is not a significant problem. However, stability is a minor problem.

The protein level and to a lesser extent the caloric level present a problem which justifies a more specific consideration of the findings. Only 38 percent of the canned meat items in the civilian market contain ten or more grams of protein per hundred grams of product and 69 percent contain one hundred or more calories per hundred grams of product (these are considered minimum levels for military use). Over half of these are the same as those used in the military rations. This group includes luncheon meat items, ham items, and fish items. Of the canned meat items in the civilian market that were suitable for use in the military (excluding container size and including only the level of nutrients) less than 2 percent were casserole items, over 3 percent were stew or hash items, and over 12 percent were poultry items. The larger number of canned meat items in the civilian market identified by different names did not provide a greater variety than that found in the military market because the difference was in name only.

## CONCLUSION

Individual canned meat items in the civilian market have some and lack other product characteristics which meet military requirements. An overall judgment based on consideration of all of the items shows that most of the canned meat items on the civilian market do not meet the need of the military consumer because they are deficient in the product characteristic of concentrated nutrients. Those that are suitable are the same as the canned meat items already in use in the military rations.

## REFERENCES

1. Preference Rating for Operational Rations, QM&CI, Report, U.S. Army Natick Laboratories, Natick, Mass., September 1956.
2. A Field Test of the Ration, Individual Combat Meal Type, QMFEC, Report T-50-56002-F, U.S. Army Natick Laboratories, Natick, Mass.
3. Testing of B Ration, 5-in-1 Ration and C Ration Items QMF&CI, Report, U.S. Army Natick Laboratories, Natick, Mass., April 1957.
4. S. R. Cecil and J. G. Woodroof, Long-Term Storage of Military Rations, QMF&CI, Report, U.S. Army Natick Laboratories, Natick, Mass., 1962.
5. Test of Meal Ready-to-Eat Individual, USATEC Report 8-37400-04k, U.S. Army Natick Laboratories, Natick, Mass., September 1964.
6. C. F. Consolazio, L. O. Matoush and C. W. Harris, Nutritional and Acceptability Evaluation of High Caloric Density Foods Under Combat Patrol Conditions, USAMRNL Report 288, Fitzsimons General Hospital, Denver, Colorado, December 1965.
7. A.O.A.C. "Official Methods of Analysis" 10th ed., Association of Agricultural Chemists, Washington, D.C., 1965.
8. F.J. Pilgrim and D.R. Peryam, Sensory Testing Methods, QMF&CI Report, U.S. Army Natick Laboratories, Natick, Mass., October 1958.

FOOD LABORATORY DISTRIBUTION LIST

Copies

2 - Commanding General  
US Army Medical Research &  
Development Command  
Main Navy Building  
Washington, D. C. 20315

1 - Commanding General  
US Army Combat Development  
Command  
ATTN: CDCMR-O  
Fort Belvoir, Virginia 22060

2 - Commanding General  
US Army Test & Evaluation  
Command  
ATTN: AMSTE-BC  
Aberdeen Proving Ground,  
Maryland 21005

1 - Commanding General  
US Army Materiel Command  
ATTN: AMCRD-JI, Development  
Directorate  
Department of the Army  
Washington, D. C. 20315

1 - Commanding General  
US Army Combat Development  
Command  
Combat Service Support Group  
Fort Lee, Virginia 23801

1 - Commanding Officer  
US Army Research Officer -  
Durham  
ATTN: CRD-AA-IP  
Box CM, Duke Station  
Durham, North Carolina 27706

1 - Commanding Officer  
US Army Combat Development  
Command  
Supply Agency  
ATTN: CDCSA-R  
Fort Lee, Virginia 23801

Copies

1 - Commanding Officer  
US Army Nuclear Defense  
Laboratory  
ATTN: Technical Library  
Edgewood Arsenal, Maryland  
21010

1 - Commanding Officer  
US Army Medical Nutrition  
Laboratory  
Fitzsimons General Hospital  
Denver, Colorado 80240

1 - Commanding Officer  
US Army Arctic Test Center  
ATTN: STEAC-TA  
APO Seattle, Washington 98733

1 - Commanding Officer  
Edgewood Arsenal  
ATTN: SMUEA-TSTI-TL  
Edgewood Arsenal, Maryland  
21010

1 - Commander  
US Army Biological Laboratories  
ATTN: Technical Library  
Fort Detrick  
Frederick, Maryland 21701

2 - Commander  
Defense Personnel Support  
Center  
ATTN: Directorate of  
Subsistence, DPSC-STT  
2800 South 20th Street  
Philadelphia, Pennsylvania  
19101

1 - Commandant of the Marine Corps  
Code A04D  
Washington, D. C. 20380

Copies

1 - Commandant  
ATTN: Head Librarian  
US Army Medical Field Service  
School  
Brooke Army Medical Center  
Fort Sam Houston, Texas 78234

2 - Executive Director  
Joint Committee on Atomic  
Energy  
Congress of the United States  
Washington, D. C. 20545

1 - Director  
Division of Biology & Medicine  
US Atomic Energy Commission  
Washington, D. C. 20545

1 - Director  
Division of Isotopes  
Development  
US Atomic Energy Commission  
Washington, D. C. 20545

2 - Director  
Biological Sciences Division  
Office of Naval Research  
Department of the Navy  
Washington, D. C. 20360

2 - Director, Development Center  
Marine Corps Development &  
Education Command  
ATTN: Combat Service Support  
Division  
Quantico, Virginia 22134

3 - Office of the Coordinator of  
Research  
University of Rhode Island  
Kingston, Rhode Island 02881

10 - Headquarters 12th Support  
Brigade  
ACoFS Services  
ATTN: Food Advisor  
Fort Bragg, North Carolina  
28307

Copies

2 - National Aeronautics & Space  
Administration  
ATTN: Acquisition Branch,  
'S-AK/DL'  
PO Box 33  
College Park, Maryland 20740

1 - US Army Combat Development  
Command  
Institute of Nuclear Studies  
Fort Bliss, Texas 79916

1 - US Department of Agriculture  
Division of Acquisitions  
National Agriculture Library  
Washington, D. C. 20250

1 - Headquarters, USAF (AFRDDG)  
DCS/Research & Development  
Washington, D. C. 20330

1 - Arctic Medical Research  
Laboratory, Alaska  
ATTN: Librarian  
APO Seattle, Washington 98731

1 - US Atomic Energy Commission  
Division of Technical  
Information Extension  
PO Box 62  
Oak Ridge, Tennessee 37820

1 - National Aeronautics & Space  
Administration  
Ames Research Center  
ATTN: J. E. Greenleaf, 239-4A  
Moffett Field, California  
94035

2 - Quartermaster School Library  
US Army Quartermaster School  
Fort Lee, Virginia 23801

1 - US Naval Research Laboratory  
Code 6140  
Washington, D. C. 20390

Copies

- 1 - US Army Command & General Staff College Library Division Fort Leavenworth, Kansas 66027
- 1 - US Atomic Energy Commission Reports Section, Headquarters Library Main Station, J-004 Division of Technical Information Washington, D. C. 20545
- 4 - Exchange & Gift Division Library of Congress Washington, D. C. 20540
- 2 - Chief, Radiation Branch Food Industries Division, 552 Business & Defense Service Administration US Department of Commerce Washington, D. C. 20230
- 1 - Chief, Life Sciences Division Army Research Office Office of Chief of Research & Development Washington, D. C. 20310

Copies

- 1 - Library, Southern Utilization Research & Development Division Agricultural Research Service, US Department of Agriculture PO Box 19687 New Orleans, Louisiana 70119
- 1 - US Army Research Office ATTN: Technical Library 3045 Columbia Pike Arlington, Virginia 22204
- 1 - Armour and Company Food Research Library 801 West 22nd Street Oak Brook, Illinois 60521
- 1 - Dr. Herbert E. Hall, Chief Food Microbiology National Center for Urban & Industrial Health Food Protection Research 222 East Central Parkway Cincinnati, Ohio 45202
- 1 - Mr. Harry W. Ketchum, Director Radiation Program Food Industries Division, BDSA US Department of Commerce, Room 4042 14th & Constitution Avenues, NW Washington, D. C. 20230

FOOD LABORATORY INTERNAL DISTRIBUTION LIST

Copies

- 25 - Chief, Technical Plans Office, NLABS  
(20 for transmittal to Defense Documentation Center)
- 2 - Technical Library, NLABS
- 10 - Program Coordination Office, Food Laboratory, NLABS
- 7 - Division Chiefs, Food Laboratory, NLABS
- 2 - Marine Liaison Officer, NLABS
- 5 - Air Force Liaison Officer, NLABS
- 1 - Director, Earth Sciences Laboratory, NLABS
- 2 - Acting Director, General Equipment and Packaging Laboratory, NLABS
- 3 - Director, Pioneering Research Laboratory, NLABS
- 1 - Commanding Officer, US Army Research Institute of Environmental Medicine, NLABS
- Project Officer and Alternate Project Officer, Food Laboratory, NLABS

Unclassified

Security Classification

DOCUMENT CONTROL DATA: R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author)		2a. REPORT SECURITY CLASSIFICATION Unclassified
US Army Natick Laboratories Natick, Massachusetts 01760		2b. GROUP
3. REPORT TITLE  Evaluation of Canned Meats in the Civilian Market for Military Use		
4. DESCRIPTIVE NOTES (Type of report and inclusive date)		
5. AUTHOR(S) (First name, middle initial, last name)  B. W. Gardner, Jr.		
6. REPORT DATE July 1968	7a. TOTAL NO. OF PAGES 28	7b. NO. OF REFS 8
8a. CONTRACT OR GRANT NO.	8a. ORIGINATOR'S REPORT NUMBER(S) 69-4-FL	
b. PROJECT NO. AE 661	8b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report) FL-63	
c.		
d.		
10. DISTRIBUTION STATEMENT  This document has been approved for public release and sale; its distribution is unlimited.		
11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY US Army Natick Laboratories Natick, Massachusetts 01760	
13. ABSTRACT  Canned meat food items available on the civilian market were analyzed for protein and caloric content and evaluated for acceptability before and after storage at 100°F for six months. A survey was made of the published reports of evaluations of military canned meat items to obtain comparative data. In general, the canned meats obtained in the civilian market were more acceptable initially but a number did not retain their acceptability under the storage conditions. In addition, a great number did not have the concentration of protein and calories required by the military consumer.		

DD FORM 1 NOV 64 1473

REPLACES DD FORM 1473, 1 JAN 64, WHICH IS  
OBsolete FOR ARMY USE.

Unclassified

Security Classification

Unclassified  
Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Acceptability		8				
Caloric content		8				
Protein content		8				
Meat (Canned)		9				
Military rations		4				

Unclassified  
Security Classification